Cloud Computing

The answer, my friend, is blowing in the wind.

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Objectives

- Define the cloud
- Risks of cloud computing
- Essence of cloud computing
- Deployed clouds in DoD

Definitions of Cloud Computing

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

(This definition is from the latest draft of the NIST Working Definition of cloud computing published by the U.S. Government's National Institute of Standards and Technology)

NIST Cloud Computing page at
http://csrc.nist.gov/groups/SNS/cloud-computing/

CLOUD COMPUTING - WORKING DEFINITION

- ***Cloud computing is an on-demand service model for IT provision, often based on virtualization and distributed computing technologies. Cloud computing architectures have:***
  - highly abstracted resources
  - near instant *scalability* and *flexibility*
  - near instantaneous *provisioning*
  - *shared resources* (hardware, database, memory, etc)
  - *'service on demand',* usually with a *'pay as you go'* billing system
  - *programmatic management*

So – what is a working definition of Cloud Computing?

The interesting thing about cloud computing is that we've redefined cloud computing to include everything that we already do. . . . I don't understand what we would do differently in the light of cloud computing other than change the wording of some of our ads.

Larry Ellison, co-founder and CEO of Oracle, quoted in the Wall Street Journal, September 26, 2008

Another view

A lot of people are jumping on the [cloud] bandwagon, but I have not heard two people say the same thing about it. There are multiple definitions out there of "the cloud."

> *Andy Isherwood, Vice President and General Manager of HP Software and Solutions, quoted in ZDnet News, December 11, 2008*

…and another view

It's stupidity. It's worse than stupidity: it's a marketing hype campaign. Somebody is saying this is inevitable — and whenever you hear somebody saying that, it's very likely to be a set of businesses campaigning to make it true.

> *Richard Stallman, founder of the GNU project and the Free Software Foundation, quoted in The Guardian, September 29, 2008*

Richard Stallman, known for his advocacy of "free software", thinks cloud computing is a trap for users—if applications and data are managed "in the cloud", users might become dependent on proprietary systems whose costs will escalate or whose terms of service might be changed unilaterally and adversely.

Open Cloud Manifesto

- http://www.opencloudmanifesto.org/ Open%20cloud%20Manifesto.pdf

- We as industry participants must work together to ensure that the cloud remains as open as all other IT technologies. Some might argue that it is too early to discuss topics such as standards, interoperability, integration and portability. Although this is a time of great innovation for the cloud computing community, that innovation should be guided by the principles of openness outlined in this document. We argue that it is exactly the right time to begin the work to build the open cloud.

What the Cloud is

The NIST definition of cloud computing defines three delivery models:

• **Software as a Service (SaaS):** The consumer uses an application, but does not control the operating system, hardware or network infrastructure on which it's running.

• **Platform as a Service (PaaS):** The consumer uses a hosting environment for their applications. The consumer controls the applications that run in the environment (and possibly has some control over the hosting environment), but does not control the operating system, hardware or network infrastructure on which they are running. The platform is typically an application framework.

• **Infrastructure as a Service (IaaS):** The consumer uses "fundamental computing resources" such as processing power, storage, networking components or middleware. The consumer can control the operating system, storage, deployed applications and possibly networking.

NIST Cloud Computing page at
http://csrc.nist.gov/groups/SNS/cloud-computing/

Four Deployment Models

- **Public cloud**: In simple terms, public cloud services are characterized as being available to clients from a third party service provider via the Internet. The term "public" does not always mean free, even though it can be free or fairly inexpensive to use. A public cloud does not mean that a user's data is publically visible; public cloud vendors typically provide an access control mechanism for their users. Public clouds provide an elastic, cost effective means to deploy solutions.

- **Private cloud:** A private cloud offers many of the benefits of a public cloud computing environment, such as being elastic and service based. The difference between a private cloud and a public cloud is that in a private cloud-based service, data and processes are managed within the organization without the restrictions of network bandwidth, security exposures and legal requirements that using public cloud services might entail. In addition, private cloud services offer the provider and the user greater control of the cloud infrastructure, improving security and resiliency because user access and the networks used are restricted and designated.

Four Deployment Models

- **Community cloud**: A community cloud is controlled and used by a group of organizations that have shared interests, such as specific security requirements or a common mission. The members of the community share access to the data and applications in the cloud.

- **Hybrid cloud:** A hybrid cloud is a combination of a public and private cloud that interoperates. In this model users typically outsource non-business critical information and processing to the public cloud, while keeping business-critical services and data in their control.

NIST - Essential Cloud Characteristics

- **Rapid Elasticity:** Elasticity is defined as the ability to scale resources both up and down as needed. To the consumer, the cloud appears to be infinite, and the consumer can purchase as much or as little computing power as they need. This is one of the essential characteristics of cloud computing in the NIST definition.

- **Measured Service:** In a measured service, aspects of the cloud service are controlled and monitored by the cloud provider. This is crucial for billing, access control, resource optimization, capacity planning and other tasks.

- **On-Demand Self-Service:** The on-demand and self-service aspects of cloud computing mean that a consumer can use cloud services as needed without any human interaction with the cloud provider.

- **Ubiquitous Network Access:** Ubiquitous network access means that the cloud provider's capabilities are available over the network and can be accessed through standard mechanisms by both thick and thin clients.

- **Resource Pooling:** Resource pooling allows a cloud provider to serve its consumers via a multi-tenant model. Physical and virtual resources are assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g. country, state, or datacenter).

Right Sizing must be RIGHT

- Computational
- Storage
- Transport
- Redundancy, Criticality

- Studies show that with proper management, companies can save 18% of their IT budget

Risks

- *The risks of using cloud computing should be compared to the risks of staying with traditional solutions, such as:*
  - *Desktop-based models*
  - *Client-Server models*

- *ALL platforms have a risk of failure. You need to recognize the new risks of clouds.*

- *There are HUGE IT personnel issues, along with changes in procurement and equipment.*

Cloud Security is your biggest risk!

- There is a potential for a new paradigm in network security. No more Maginot Line Defense!

- Move from passive defense (firewalls, etc) to active defense.
  - If instance of cloud is under attack.
    - Move to another cloud and create a VPN load with new IPs to terminal.

Security Risks (continued)

- *This class of risks includes the failure of mechanisms separating storage, memory, and routing between **different tenants** of the shared infrastructure (e.g., so-called guest-hopping attacks, SQL injection attacks exposing multiple customers' data stored in the same table, and side channel attacks).*

Security Risks (continued)

- The risk of "insider malicious intent" now spreads not only to YOUR employees, but also to all employees of the cloud.

- Sniffing, spoofing, man-in–the-middle attacks, side channel and replay attacks should be considered as possible threat sources.

Security Risks (continued)

- Cloud computing, being a distributed architecture, implies more data in transit than traditional infrastructures. For example, data must be transferred in order to synchronize multiple distributed machine images, images distributed across multiple physical machines, between cloud infrastructure and remote web clients, etc. Furthermore, most use of data-center hosting is implemented using a secure VPN-like connection environment, a practice not always followed in the cloud context.

Cloud Availability is the second biggest risk!

- Any interruption or corruption in the chain or a lack of coordination of responsibilities between all the parties involved can lead to losses due to failure to meet customer demand, violation of SLA, cascading service failure, etc.
    - Unavailability of services
    - Loss of data confidentiality
    - Integrity issues
    - Availability issues
    - Economic cascading failures
    - Loss of reputation

Availability Risks (continued)

- Oct, 2009
  - T-Mobile wrote to customers that "personal information stored on your [mobile] device--such as contacts, calendar entries, to-do lists or photos--that is no longer on your Sidekick almost certainly has been lost as a result of a server failure at Microsoft/Danger."
- Sept 2009
  - the SaaS startup Workday, which has about 100 customers using its cloud-based human resources, payroll, and financial applications, had a 15-hour outage on Sept. 24. In this case, the back-up system in place worked—it detected a corrupted storage node—but then it took itself offline." It is ironic that the redundant backup to a system with built-in redundancy caused the failure.

Risk Summary

- *You now have risks as both the **developer** and the **customer** (consumer)*

- *Your access to the cloud is your lifeline. Sever the connection, and you have NO access to your data or processing platforms.*

- *Do not progress to the cloud until you have a clear and organized plan on how to handle, manage, and mitigate the inherent cloud-computing risks.*

The DoD is already moving to clouds

- DISA –RACE "**RAPID ACCESS COMPUTING ENVIRONMENT"**
  - With RACE, you can customize, purchase, and receive your platform within 24 hours. You can now order RACE Development, Test, and Production virtual environments to support your life cycle requirement.

- AF IBM cloud
  - support defense and intelligence networks
  - 10-month project will utilize IBM's "stream computing,"

RACE

Offers You the Pole Position in Developmental and User Testing:	Road-Tested and Secure Computing Environment:

•24-hour provisioning
 	
•Online self-service
 	
•Credit card or MIPR payment options
 	
•Month-to-month service
 	
•Capacity on demand
 	
•No annual maintenance fees
 	
•No capital investment required
 	
•Pay only for what you need
 	
•365/24/7 service desk support
 	
•Costs per month/image
	•DECC standard platforms
	
	•Developed under DoD IA standards
	
	•NIPR connectivity
	
	•Multiple virtual configurations available: 1-4 CPU, 1-8 GB memory, 60 GB of storage operating environment
	
	•Your choice of operating environments:
	  •MS Windows
	  •Red Hat Linux

SADIE (US Navy's SPAWAR Systems Command Architecture Development and Integration Environment) provides participating DoD program managers and architects a secure, web-based, DoDAF 2.0 compliant architectural product development and integration environment. Its suite of applications facilitates development of DoDAF 2.0 standard protocols and profiles to unify management of data centric architectures. SADIE's configuration enables intuitive administration of heterogeneous architectural frameworks in a collaborative environment regardless of location. SADIE delivers an infrastructure of resources to seamlessly aggregate architecture development and project management. With SADIE's enterprise-wide structure, programs realize significant cost savings by providing a virtual, service-oriented capability for DoDAF 2.0 architecture development.

Website: https://sadie.spawar.navy.mil

https://sadie.spawar.navy.mil/ - Windows Internet Explorer

https://sadie.spawar.navy.mil/

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Favorites   Portail UCOPIA   IA Education, Training an...   IA Education, Training an...   Link to DCPDS Portal (2)   Link to DCPDS Portal   Suggested Sites ▼   Get More Add-ons ▼

https://sadie.spawar.navy.mil/   Page ▼   Safety ▼   Tools ▼

DEVELOPMENT

Hello Eugene,
Welcome to SADIE

To begin, click on the "User registration process" link below.

SADIE provides participating DoD program managers and architects a web-based DoD Architecture Framework architectural product development and integration environment. SADIE supports architectural product development workflow, providing teams and managers a web-based capability in the architectural white space between an architectural need and registering DODAF compliant products with the DoD Architecture Registry System.

SADIE Help Desk Phone: (757) 613-2815

Signup & Registration

- User registration process
- Register as a new user
- Project registration process
- Register a new project

Recent News!

SADIE Tools

- Conferencing Manager
- CORE New!
- DOORS
- Elements Repository
- iGrafx Process for Six Sigma New!
- Minitab
- Rational Change New!
- System Architect (SA)
- SA Encyclopedia Manager
- SA Information Web Publisher
- SA Compare
- Teamcenter New!
- Troux Architect

Active Projects

- Joint Architecture Federation Env
- SADIE
- SADIE EA

NAERG

- Download NAERG Lists

Links of Interest

- Naval Collaborative Engineering Environment (NCEE)
- DoD Architecture Registry System (DARS)
- PKI Root Certificates New!

Training

- Register for SADIE training

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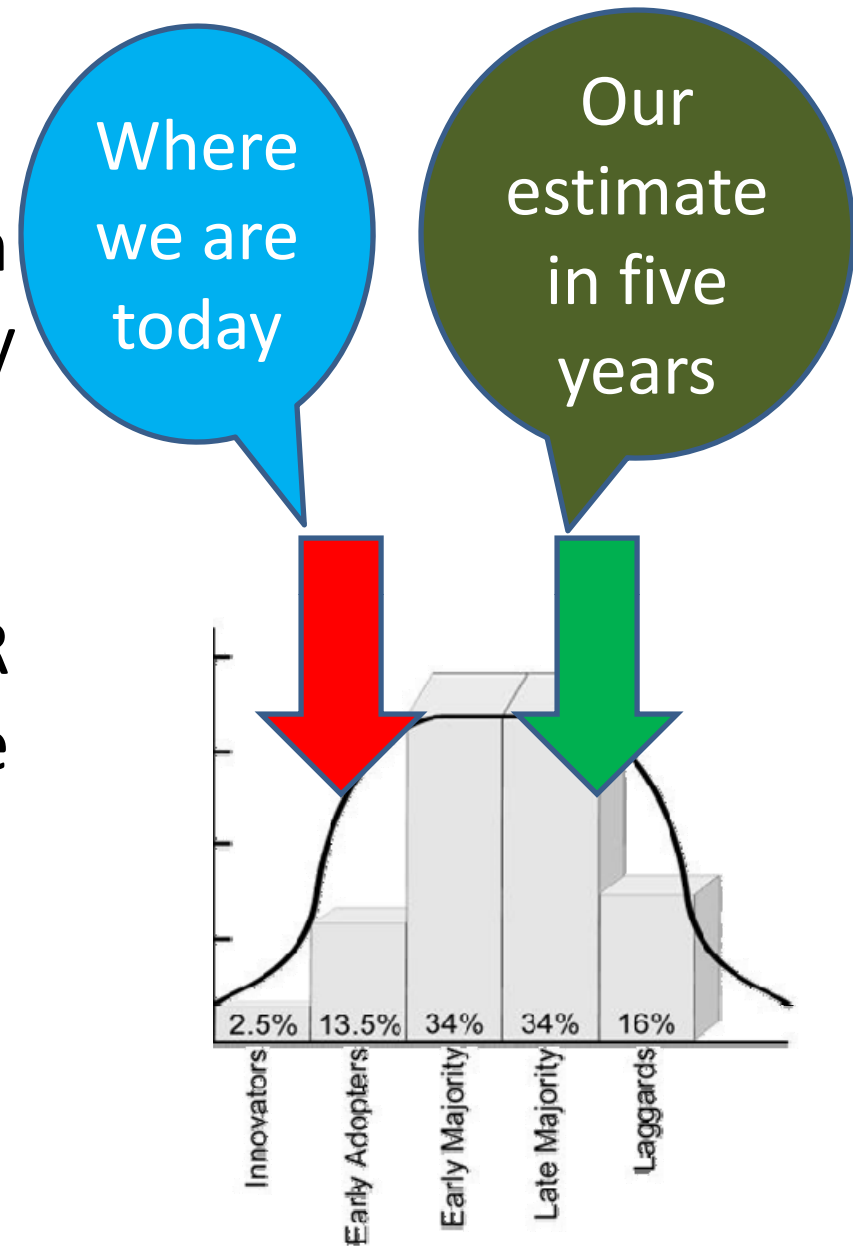
DEVELOPMENT

Clouds For Tactical Environment

- Advantages are transparent (with correct setup) redundancy of data and processing

- Local instance can have real-time mirror in the cloud.
  - If network connection is lost tactical information can still be processed.
  - If instance is disabled then another instance can continue processing.

Conclusions

- For cloud computing to reach the full potential promised by the technology, it must offer solid Information Security

- IS cannot be organized AFTER the move. You must organize and plan NOW

- You CANNOT delegate away the risks of any technology

- The cloud is here now – so plan accordingly

Where we are today

Our estimate in five years

2.5% | 13.5% | 34% | 34% | 16%

Innovators | Early Adopters | Early Majority | Late Majority | Laggards

In summary…

…so many things I would have done,

but clouds got in my way.

I've looked at clouds from both sides now.

From up and down, and still somehow

It's cloud illusions I recall.

I really don't know clouds, at all.

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http://www.computerworld.com/s/article/9134625/
Busting_the_nine_myths_of_cloud_computing?taxonomyId=170&pageNumber=1

Cloud Computing in a Military Context – Beyond the Hype

Tom Greenfield, DISA Office of the CTO